



infrastructure • public works • environmental • community water



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Subject

Preliminary Aquifer Pumping Test Results and Assessment of Bally Plume
Migration Potential for Proposed [REDACTED] South Water Supply Well,
Bally Groundwater Contamination Superfund Site,
Bally Borough, Berks County, Pennsylvania
ARCADIS Project No. NP000597

ENVIRONMENTAL

Dear Mr. Fridirici:

Date
May 25, 2004

This letter report has been prepared to address concerns raised by various parties regarding the proposed "[REDACTED] South" water supply well location. The [REDACTED] South property is proposed as a potential location for a new water supply well for the Bally Public Water System (PWS). This report presents information on a preliminary aquifer pumping test performed at the Shuhler South property, as well as ARCADIS G&M, Inc.'s (ARCADIS') evaluation of the potential for migration of impacted groundwater from the Bally Groundwater Contamination Superfund Site (Site) to a future water supply well at the Shuhler South property. Other issues, such as potential impacts of future wells on adjacent properties and wetlands in the vicinity of a future supply well at the Shuhler South location, will be addressed in a separate report.

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This report presents background hydrogeologic information for the Bally Site, a description of the preliminary aquifer pumping test, a discussion of the data obtained from that test and other factors that are relevant to the consideration of the Shuhler South property for a future Bally PWS well.

1.0 Site Setting and Local Geologic Information

As an initial step in ARCADIS' evaluation process, local geology was evaluated based on published geologic mapping and available borehole logs. This information included historical site-specific reports prepared for the Bally Site, as well as regional geologic literature.

The southern portion of the Borough (including the former Bally Engineered Structures facility), Municipal Well No. 3 and most of the associated Site monitoring wells exist within a lobe of fanglomerate deposits. This southern lobe of fanglomerate deposits is separated from another lobe of fanglomerate deposits at the [REDACTED] property by a band of the less permeable shales of the Brunswick Formation. These geologic units are presented on the attached Figure 1.

Part of a bigger picture

AR300221

The USEPA and ARCADIS completed independent fracture trace analyses which indicate the existence of major fractures that separate the [REDACTED] South location from the Borough of Bally and which likely provide a degree of hydraulic separation between the two areas. The apparent presence and orientation of these fractures are additional features that support the concept of hydraulic separation between these areas. The fracture traces are also presented on Figure 1.

In addition, regional geological mapping completed during the Newark Basin Coring Program (R. W. Schlische, Geological Society of America Bulletin, v. 104, p. 1246-1263, October 1992) indicates the presence of an anticline in the area of Bally. An anticline is a structural feature that changes the orientation of the bedding planes along which groundwater would flow. An anticline would limit the development of a hydraulic gradient between the plume and the [REDACTED] South location under pumping conditions at [REDACTED] South.

Local and regional geologic mapping and field observations appear to indicate that the local strike of bedding is in a northwest-southeast orientation. This provides evidence in support of the anticlinal feature that is mapped in the area. Additional topographic (topographic low corresponding with the zone of maximum stress) and geologic (presence of Brunswick along axis of anticline and fanglomerate along axis of synclines) indicators also provide evidence of the anticline.

The geologic features described above provided the technical basis for further evaluation of the [REDACTED] South location through field testing. Therefore, a 300-foot deep, six-inch diameter test borehole was installed at the [REDACTED] South property, and a preliminary aquifer pumping test was conducted as described below.

2.0 Results of Preliminary Shuhler South 48-hour Aquifer Pumping Test

The maximum pumping rate for the 48-hour aquifer pumping test was 230 gallons per minute (gpm), and was limited by the size of the pump that could safely be installed in the borehole. Maximum drawdown within the test borehole was only approximately 25 feet.

Because the open borehole intervals of Municipal Well No. 1 and Well 87-8I span fracture zones that occur at elevations similar to fracture zones in the [REDACTED] South test borehole, they are valid monitoring points for evaluating whether the Bally plume would migrate toward a future water supply well at the [REDACTED] South location. Table 1 presents the elevations of known fractures in the borehole at the [REDACTED] South location and in the monitoring wells observed during the preliminary aquifer pumping test. Graphs of water level vs. time, and hydrological and meteorological data for the aquifer testing period, are presented on Figures 3 through 6.

No groundwater level change attributable to pumping at the [REDACTED] South test borehole was noted in Municipal Well No. 1 or Well 87-81. The Shuhler South borehole is located approximately 2,800 feet and 2,400 feet from Municipal Well No. 1 and 87-81, respectively. The locations of these wells are presented on the attached Figures 1 and 2.

Note that a consistent, somewhat cyclic response to pumping of the Bally Ribbon Mill well was noted in Municipal Well No. 1 and Well 87-81. This response can be observed in the water levels presented on Figures 3, 4 and 6. The Bally Ribbon Mill well is located approximately 250 feet from Municipal Well No. 1 and approximately 1,000 feet from Well 87-81. The location of the Bally Ribbon Mill well is presented on Figures 1 and 2. Note that the Bally Ribbon Mill well, pumping at approximately 130 gpm for approximately 10 minutes per pumping cycle, caused an observable water level influence in Municipal Well No. 1 and Well 87-81, while pumping 230 gpm for 48 hours at the [REDACTED] South property caused no observable effect at these wells. This suggests that long-term pumping at the [REDACTED] South location would not exert a significant hydraulic influence in the vicinity of Municipal Well No. 1 and Well 87-81.

'See graph

Water levels in Wells 92-19I, 87-71 and 87-7S also were monitored, and no response to pumping at the [REDACTED] South location was noted. These wells are located approximately 3,600 feet from the [REDACTED] South borehole.

The observations described above, which were made during and after the preliminary 48-hour pumping test, are consistent with what was expected after the review of hydrogeological information described in Section 1 above. The data collected and reviewed all indicate hydraulic separation due to stratigraphic and structural features between the [REDACTED] South location and the Borough of Bally, and therefore hydraulic separation of Shuhler South from the Bally Site groundwater plume. The lack of response in the monitored wells due to pumping at the [REDACTED] South location indicates that there is a very limited potential for a future [REDACTED] South supply well to exert meaningful hydraulic influence on the Bally Site groundwater plume.

3.0 Distance from Shuhler South to Present Bally Plume

The distance from the [REDACTED] South location to the 5 microgram per liter ($\mu\text{g/L}$) trichloroethene (TCE) concentration "contour" (estimated line of equal concentration) is approximately 3,500 feet. The estimated 5 $\mu\text{g/L}$ contour is not presented on Figure 1, but it is near the estimated 10 $\mu\text{g/L}$ Total VOC contour presented on this figure. The distance to the 3 $\mu\text{g/L}$ 1,4-dioxane estimated concentration contour is approximately 4,600 feet¹. Other site constituents (1,1,1-

¹ Note that the distance to well 97-231 is 3,700 feet. The 1,4-dioxane result for the March 2004 monitoring event at this well is 9.2 $\mu\text{g/L}$, and may be an isolated occurrence; 1,4-dioxane was not detected in this well for the prior three monitoring events.

TCA, 1,1,-DCE, etc.) generally are not found above their Maximum Contaminant Levels (MCLs), except at Municipal Well No. 3.

The anticipated zone of depressed groundwater levels due to future pumping of a municipal supply well at the [REDACTED] South location would not be expected to extend to those locations where site constituents in groundwater exceed their MCLs/standards. Even if drawdown eventually was observed at Municipal Well No. 1 during pumping at a [REDACTED] South well, this would not necessarily mean that site constituents could be drawn to the [REDACTED] South location. Furthermore, the hydraulic gradient as mapped at the Site is toward the east from the Bally groundwater plume, and not toward the [REDACTED] property. Pumping at a [REDACTED] South well would need to cause sufficient drawdown in the plume area to overcome the present hydraulic gradient. Given the distances involved, causing such drawdown in the plume area would not be likely.

4.0 Continued Operation of Well No. 3

Because of the 1991 Consent Decree between USEPA and the Bally Site PRPs, Municipal Well No. 3 is expected to remain in operation as long as the Bally Site source area presents a threat to downgradient groundwater quality. Furthermore, there are numerous backup arrangements in the event that the Municipal Well No. 3 remedial system breaks down. These features include the existing Bally PWS reservoir, a new backup air stripper, backup pump and backup parts.

The existing treatment system appears to have controlled the continued release of site constituents from the original source area, and the site plume extent and concentrations have decreased since the Municipal Well No. 3 extraction/treatment system began operation in 1988. These decreasing trends are expected to continue along with continued operation of the Municipal Well No. 3 treatment system. Likewise, any other future Bally Site remedial technologies likely would result in a further decrease of source area constituent mass and thus would further enhance and protect groundwater quality downgradient of the source area.

5.0 Next Steps

As noted above, a separate report will be provided on the potential impact from future wells on adjacent properties and the potential impact of a [REDACTED] South water supply well on nearby wetlands. In addition, an Aquifer Test Plan Addendum will be prepared to provide additional detail on the monitoring associated with any future aquifer testing at the Shuhler South location.

If you have any questions or comments regarding this report, please contact Michael Bedard at (267) 685-1821. We anticipate that further discussion may be necessary between PADEP, USEPA, Bally Borough and ARCADIS regarding the information presented above. We are interested in resolving the issues associated with the Shuhler

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Mr. Thomas Fridirici
May 25, 2004

South location, and would like to schedule a conference call or site meeting with you and the other stakeholders to review any comments on this report as soon as possible. We will follow up with you to determine if such a call or meeting is necessary.

Sincerely,

ARCADIS G&M, Inc.



Daniel J. McCarthy
Project Geologist



Michael F. Bedard, P.E.
Project Manager

Attachments

Copies:

Susan Werner, PADEP
Mitch Cron, USEPA
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Tom Hemerka, Bally Borough
Greg Unger, Systems Design Engineering, Inc.
Jeff Peffer, Peffer Geotechnical Corp.
Ron Gahagan, American Household, Inc.
Chris Ann Gahagan, Sunbeam Products, Inc.

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Table 1. Fracture Zone Elevations in Various Monitoring Wells, Bally, Pennsylvania.

Depth	Well ID				
	87-71	92-191	87-81	SH-PB*	SH-FH*
RPE	468.3	453.03	446.4	460	465
Elevation					
490					
480					
470					
460	O				O
450		O			
440		O	O		
430		O			
420		O			
410		O			
400		O		X	
390		O			--X
380		O			
370		O	X		
360	X	OX		X	
350		O		X	
340	X	O	X		
330	--	O			
320		O	X	X	
310		O	--		
300		OOX			
290		OOX			
280		OOX			
270		XX		X	
260		--XX			
250		XX			
240					
230					
220					
210					
200		X			
190		X			
180		X			
170		X			
160		X			
150		X			
140					

Notes:

RPE = Reference Point Elevation

SH-PB = Shuhler South Pilot Boring

SH-FH = Shuhler South farm house well

Fracture resolution 10 - 20 feet depending on data source.

O = Cased Portion of Well (identified where known)

X = Fracture Zone

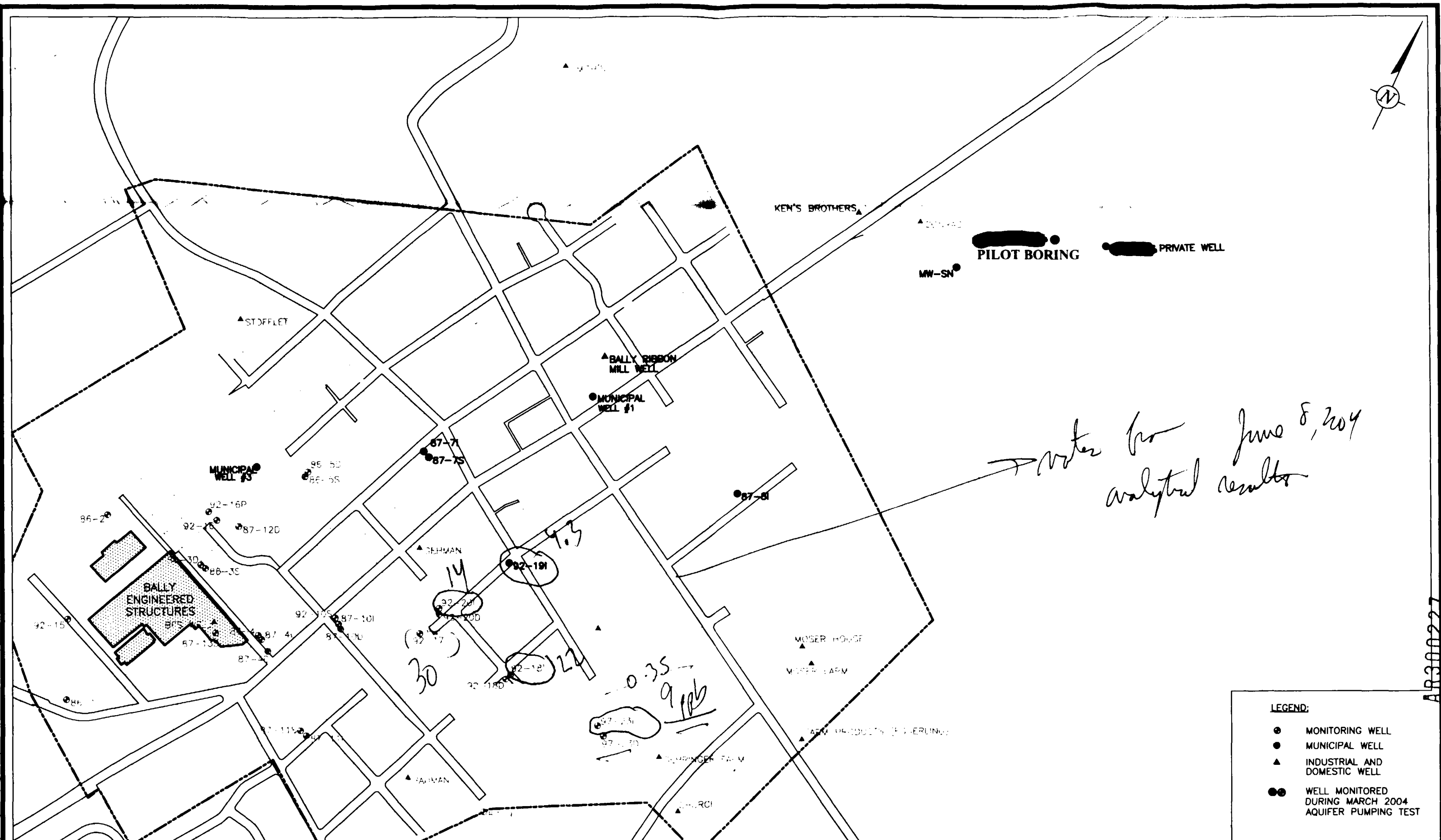
XX= HIGH yielding fracture zone.

-- = Bottom of Well

— = Bottom of boring

* = Land surface elevation approximated from topographic map.

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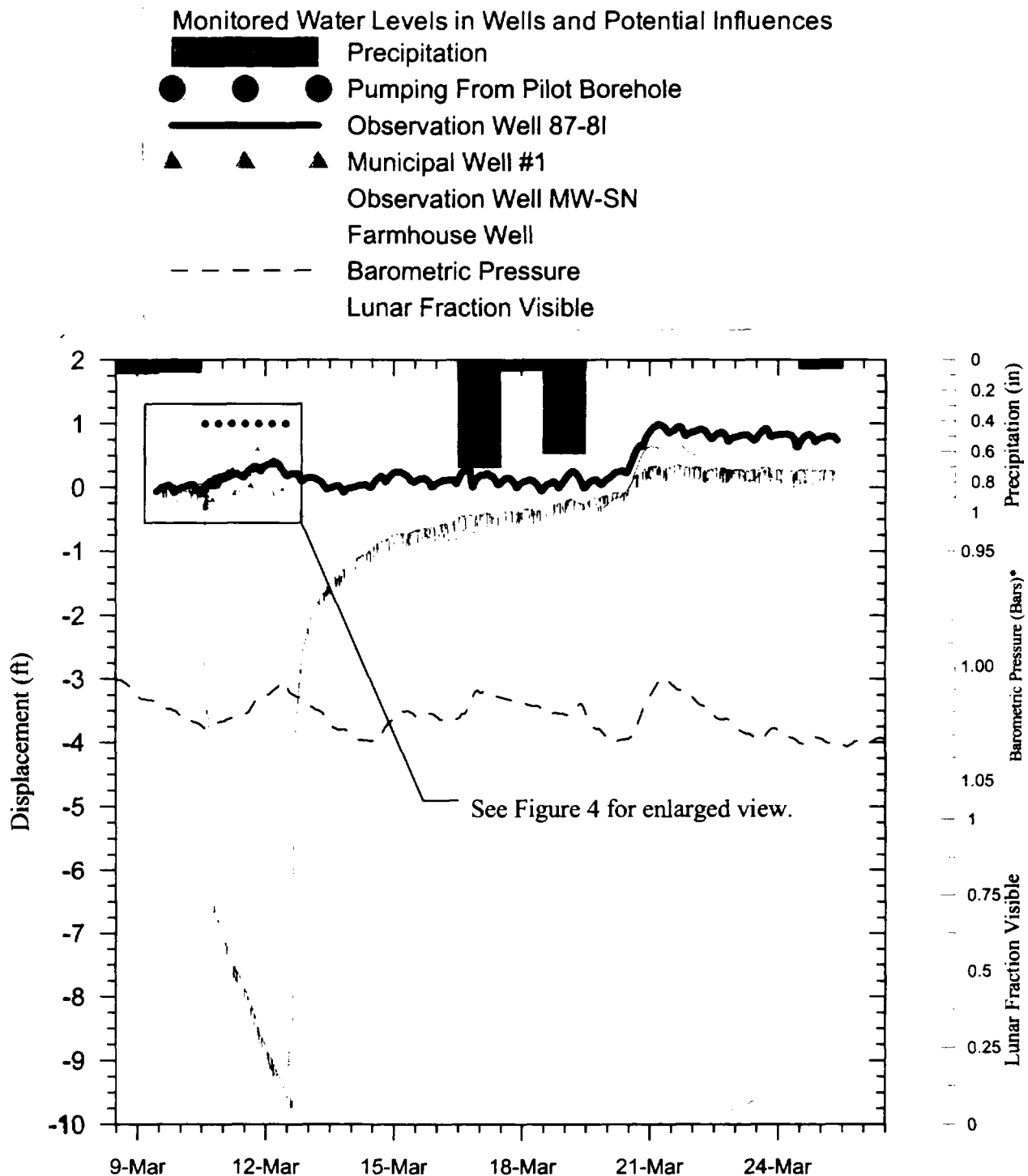
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BALLY BOROUGH
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Figure 3. March 2004 Aquifer Pumping Test, [REDACTED] South Site Pilot Borehole, Bally, Pennsylvania.

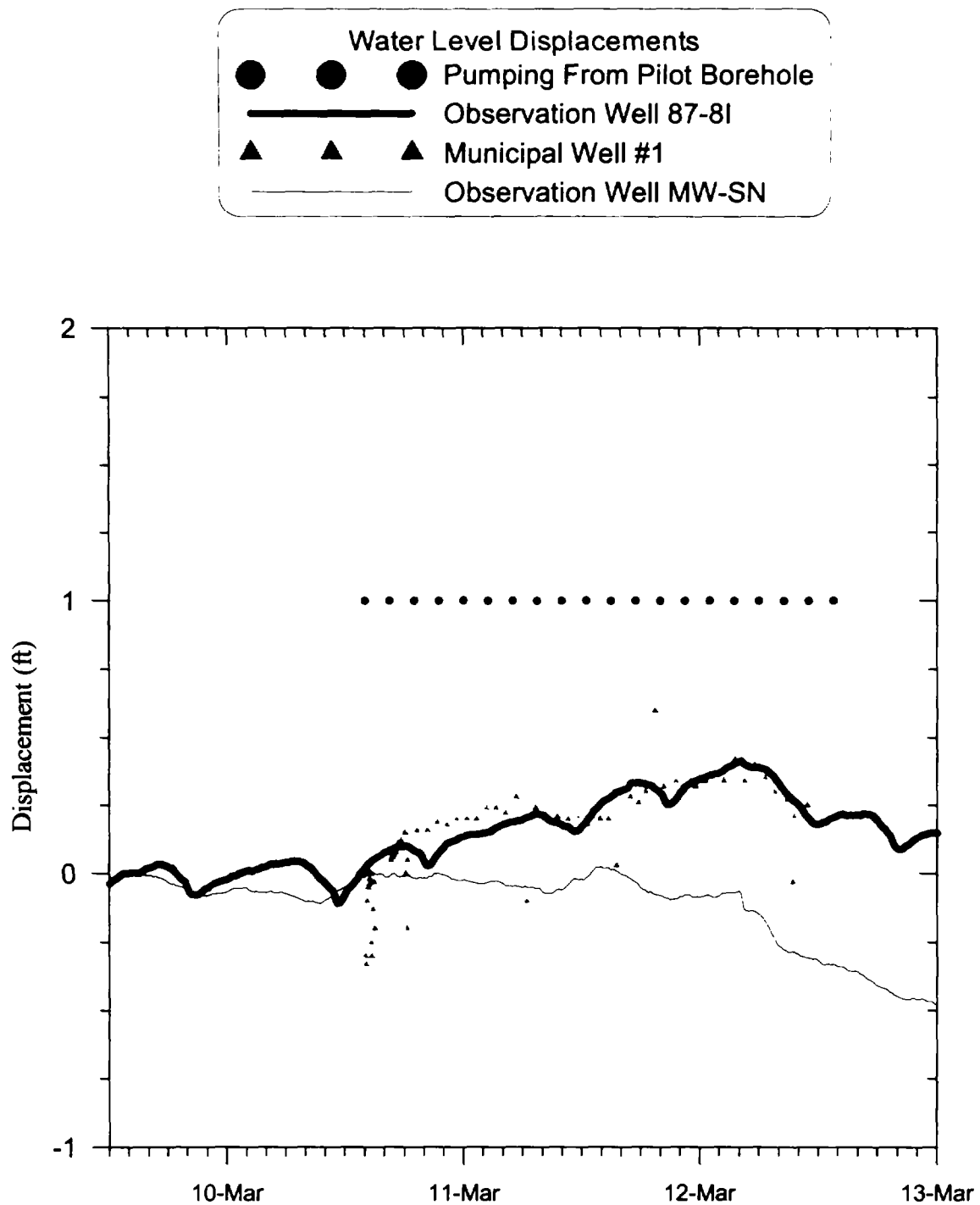


Summary of water level displacement in selected wells monitored during the 49 hour pumping test conducted at the [REDACTED] south site in March of 2004. Also shown are barometric pressure fluctuations, fraction of the lunar disc visible and the period which the pump was operating in the pilot borehole. The pilot boring located at the [REDACTED] south site was pumped at 120 gallons per minute (gpm) for the first 52 minutes, 185 gpm for the next 75 minutes and 230 gpm for the remaining 45 hours of the test. Also monitored were wells 92-19I, 87-7S and 87-7I. Water level changes in these wells were attributable to barometric pressure fluctuations.

*Barometric Pressure Data from Pottstown, PA (approx. 15 mi southeast of Bally).

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Figure 4. Data From Selected Wells, March 2004 Aquifer Pumping Test, Shuhler South Site Pilot Borehole, Bally, Pennsylvania.



Detailed summary of water level displacement in selected wells monitored during the 49 hour pumping test conducted at the Shuhler south site in March of 2004. Also shown is the period for which the pump was operating in the pilot borehole. The pilot boring located at the Shuhler south site was pumped at 120 gallons per minute (gpm) for the first 52 minutes, 185 gpm for the next 75 minutes and 230 gpm for the remaining 45 hours of the test.

AR300229

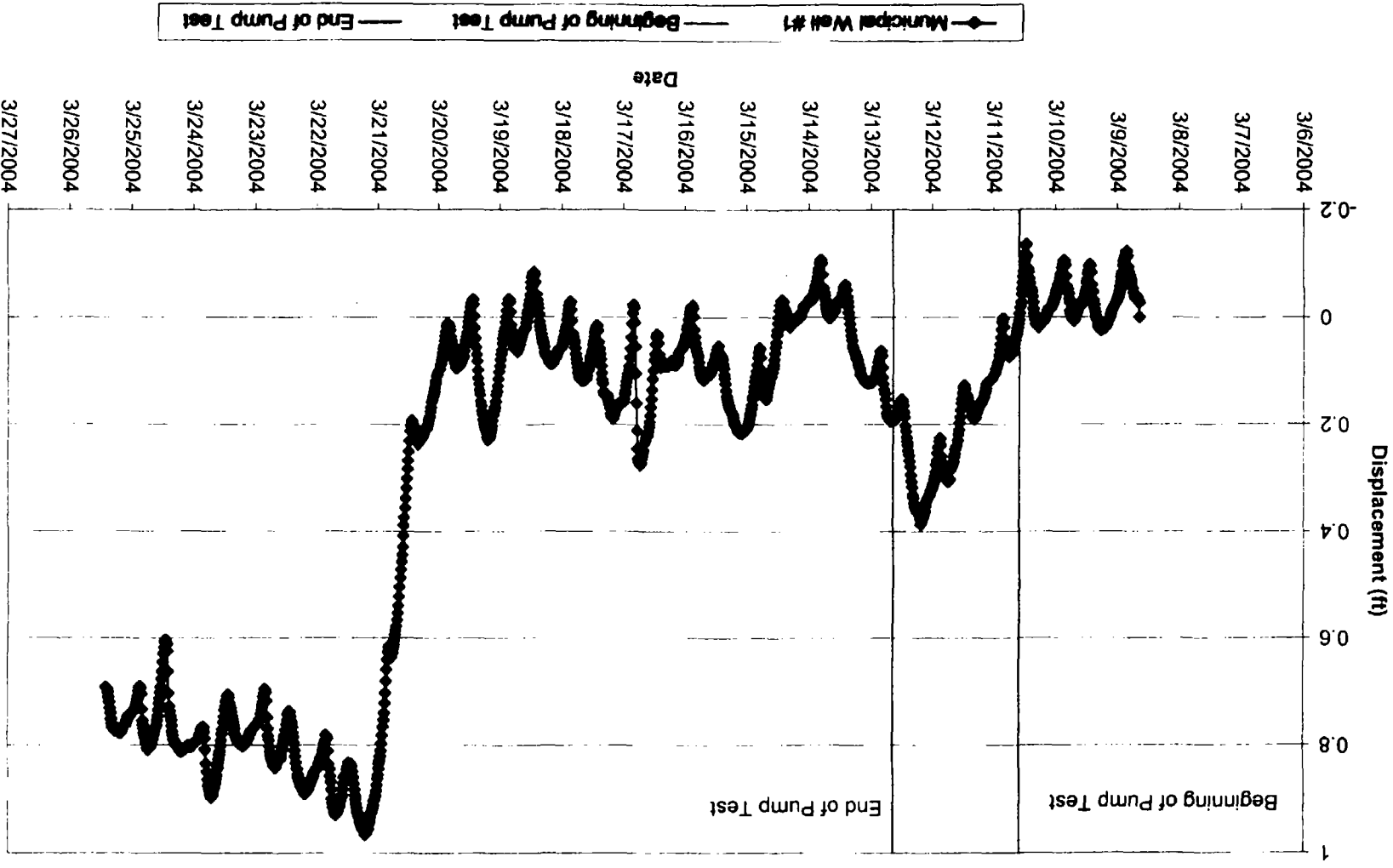


Figure 5: Displacement of Water Level Before, During, and After Aquifer Test for Observation Well 87-81

AR300231

